

**MERGING OF WRITER IDENTIFICATION TECHNOLOGY INTO
MOBILE APPLICATION FOR
FORENSIC DOCUMENT HANDWRITING ANALYSIS**

ENG WEI SY

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS TESIS*

JUDUL : MERGING OF WRITER IDENTIFICATION TECHNOLOGY INTO
MOBILE APPLICATION FOR FORENSIC DOCUMENT
HANDWRITING ANALYSIS

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Tarikh: _____

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MERGING OF WRITER IDENTIFICATION TECHNOLOGY
INTO MOBILE APPLICATION FOR
FORENSIC DOCUMENT HANDWRITING ANALYSIS

ENG WEI SY

This report is submitted in partial fulfilment of the requirements for the
Bachelor of Computer Science (Software Development)

FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY
UNIVERSITI TEKNIKAL MALAYSIA MELAKA
2013

DECLARATION

I hereby declare that this project report entitled
**MERGING OF WRITER IDENTIFICATION TECHNOLOGY
INTO MOBILE APPLICATION FOR
FORENSIC DOCUMENT HANDWRITING ANALYSIS**

is written by me and is my own effort and that no part has been plagiarized
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STUDENT : _____ Date: 27-AUGUST-2013
(ENG WEI SY)

SUPERVISOR : _____ Date: 27-AUGUST-2013
(DR. AZAH KAMILAH MUDA @ DRAMAN)

DEDICATION

This project is dedicated to my mother who has never failed to give me financial and moral support, for giving all the need during the time this system is developed and for teaching me that even the largest task can be accomplished if it is done one step at a time.

ACKNOWLEDGEMENTS

First of all I would like to express the greatest thanks to my mother for giving me the financial and moral support, for giving all the need during the time this system is developed and for teaching me that even the largest task can be accomplished if it is done one step at a time.

Next I would like to thank my supervisor, Dr. Azah Kamilah Muda @ Draman, for guiding me all along the way to do a system from nothing to a complete full operating system. Thanks to her for guiding me on how to make a system better and thanks to her for correcting my problems and telling me flaws in my system.

I would also take this chance to thank to my senior, Satrya Fajri Pratama for guiding me on techniques regarding writer identification. Thanks to him for the efforts, time, and patience in making me to understand the whole concept of writer identification processes.

Lastly, I would like to take this chance to thanks my friends for supporting me on completing my system, and for their helps in testing the system as end users.

ABSTRACT

This project is about developing a researched prototype for a proposed program which demonstrates the use of writer identification (WI) technology on mobile devices. There are many techniques or algorithms used to determine the authorship of handwritten document, and WI technology which uses the enhanced United Moment Variant (UMI) algorithm proves its ability to accurately determine the authorship of a handwritten document out of many known specimens. This project will integrate the WI technology to a mobile application to prove its ability to works with mobile devices. With the advanced technology on nowadays mobile devices, WI technology will works very well in mobile devices and will explore its capability to be used in many fields such as handwriting identification for forensic, history, medical, financial, and business. The integrated camera and tablet technology on mobile devices enhanced the user experience of mobile application, which also directly enhanced the user experience of mobile devices to be used as a tool for handwriting identification. The development of distributed computing and also web services has solves many problems of software development such as portability and maintainability. The mobile application developed in this project is using the principle of distributed computing and web service. There is a client and server application to allow distributed use of the system, and the application is supported by web service to allow any other application to access its services when needed. The web service of this system is using SOAP technology which provides better security.

ABSTRAK

Projek ini adalah tentang pembangunan sebuah prototaip untuk program yang boleh menunjukkan penggunaan teknologi pengenalan penulis (WI) pada peranti mudah alih. Terdapat banyak teknik atau algoritma yang digunakan untuk menentukan pengarang dokumen tulisan tangan, dan teknologi WI yang menggunakan algoritma United Moment Varian (UMI) yang dipertingkatkan membuktikan keupayaannya untuk menentukan pengarang dokumen tulisan tangan daripada banyak spesimen dengan tepat. Projek ini akan mengintegrasikan teknologi WI kepada aplikasi mudah alih untuk membuktikan keupayaannya untuk berfungsi di peranti mudah alih. Dengan teknologi canggih peranti mudah alih pada masa kini, WI teknologi akan berfungsi dengan baik dalam peranti mudah alih dan akan meneroka keupayaannya untuk digunakan dalam pelbagai bidang seperti pengenalan tulisan tangan untuk forensik, sejarah, perubatan, kewangan, dan perniagaan. Teknologi kamera dan tablet bersepadu pada peranti mudah alih akan meningkatkan pengalaman pengguna aplikasi mudah alih, yang juga secara langsung akan meningkatkan pengalaman pengguna peranti mudah alih untuk digunakan sebagai alat mengenal pasti tulisan tangan. Pembangunan pengkomputeran teragih dan juga perkhidmatan web telah menyelesaikan banyak masalah pembangunan perisian seperti keupayaan mudah alih dan penyelenggaraan. Aplikasi mudah alih yang dibangunkan dalam projek ini menggunakan prinsip pengkomputeran teragih dan perkhidmatan web. Terdapat pelanggan dan pelayan yang membenarkan penggunaan menggunakan sistem secara teragih, dan system ini disokong oleh perkhidmatan web untuk membenarkan system lain untuk mengakses perkhidmatan system apabila diperlukan. Perkhidmatan web sistem ini menggunakan teknologi SOAP yang menyediakan keselamatan yang lebih baik.

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LIST OF ABBREVIATIONS

ADT	-	Android Development Tools
API	-	Application Programming Interface
APK	-	Android Application Package File
CC	-	Configuration Controller
CDT	-	C/C++ Development Toolkit
COBOL	-	Common Business-Oriented Language
CS	-	Creative Suites
DBA	-	Database Administrator
DDR3 SDRAM	-	Double Data Rate Type Three Synchronous Dynamic Random Access Memory
EE	-	Enterprise Edition
ERD	-	Entity Relationship Diagram
FDE	-	Forensic Document Examiner
FDHA	-	Forensic Document Handwriting Analysis
FISH	-	Forensic Information System for Handwriting
GB	-	Gigabytes
GIWIS	-	Groningen Intelligent Writer Identification System
IDE	-	Integrated Development Environment
IT	-	Information Technology
J2EE	-	Java 2 Platform, Enterprise Edition
JDK	-	Java Development Kit
JDT	-	Java Development Tools
JPA	-	Java Persistence API

JRE	-	Java Runtime Environment
JSF	-	Java Server Faces
LAN	-	Local Access Network
MB	-	Megabytes
ML	-	Module Leader
OOP	-	Object-oriented Programming
OS	-	Operating System
PHP	-	Personal Home Page
PDT	-	PHP Development Tools
PM	-	Project Manager
PSM	-	Projek Sarjana Muda
QoS	-	Quality of Service
RAM	-	Random Access Memory
RDBMS	-	Relational Database Management System
SDK	-	Software Development Kit
SDT	-	Software Development Team
SDLC	-	Software Development Life Cycle
SI	-	International System of Units
SOA	-	Service-Oriented Architecture
SOAP	-	Simple Object Access Protocol
SQA	-	Software Quality Assurance
UI	-	User Interface
USB	-	Universal Serial Bus
UDDI	-	Universal Description, Definition, and Integration
WI	-	Writer Identification
WSDL	-	Web Services Description Language
XML	-	Extensible Markup Language

CHAPTER 1

INTRODUCTION

This chapter will introduce the project background and the problem statements of this project. The chapter then followed by the objectives and scopes of the project, and concluded with expected output and the conclusion.

The project background section briefly introduces the writer identification (WI) technology, which is also the main reason to the initiative of this project. Project background section will also discuss about the process of handwriting analysis by forensic by which the WI is based on.

It then introduces on the rapid development of mobile application and highlights the importance of portability of an application to end users. This becomes the main problem statement of WI technology.

The chapter is then followed by the aim of the project, the merging of WI technology into mobile application using forensic document handwriting analysis as the main domain. A new mobile application for forensic document handwriting analysis is proposed in this project to use WI technology in mobile devices.

Finally, it will conclude the chapter with the project significant and the expected output of the project which will show how by building a mobile application could help to extend the potential of WI technology.

1.1 Project Background

Writer Identification (WI) is a dynamic biometric pattern recognition technology being researched with promising result. WI technology identifies and differentiates writers based on the unique features or style of writing while ignoring the meaning of the word or character written. Human writing has its own unique characteristics and will not be the same to each other (Pramata, Muda, & Choo, 2011). It is by using these unique characteristics, WI are able to distinguish writer of handwriting from one another.

While the WI technology is yielding promising results, mobile applications are also advancing rapidly and are having high demands in the mobile market. Using WI technology, this project aims to merge the technology into mobile application to perform forensic document handwriting analysis at mobile devices. The projects are built for future technology needs where the world no longer use papers, and documents are all digitalised. When the time comes, human no longer need to sign or write on papers, but dynamically on electronic screens. This is where and how the WI plays its roles on mobile applications.

This project also aims to recommend the WI as a technology that can bring artificial intelligence world to the next level. Writing dynamically on electronic screen enable handwriting to be analysed by technology and thus yielding a more precise and faster analysis compared to manual analysis by current forensic document examination. Forensic Document Examination is the process or act of identifying forgery and establishing the authenticity of documents in dispute (Southeastern Association of Forensic Document Examiners, 2013).

This project uses United Moment Invariant (UMI) algorithm for the handwriting features extraction process. UMI has a good description of image shape and thus it is explored its capability of image representation in WI domain (Pramata, Muda, & Choo, 2011).

This project is fully dependent on the research on WI technology and thus the result will also be dependent on the stage of WI research. This project has the potential to unleash the potential of writer identification technology in digital world.

1.2 Problem Statements

Portability has always been an important issue in software application, especially when mobile devices technology is advancing rapidly. Portability of software application can be defined as the ability of user to access the application or system anywhere and anytime. It is now a need for any application to be portable to achieve the highest usability to end users.

Mobile devices are so advanced now that most of the computer tasks could be done via mobile devices. With such advancing technology of mobile devices, it is the time to try adapting WI technology into future use by implementing the technology into the use of mobile devices.

As such, a distributed mobile application which enable user to perform handwriting analysis for digital document using the WI technology is proposed.

1.3 Objectives

The main objectives of this project are:

1. to merge the writer identification technology within the mobile world,
2. to develop a distributed mobile application for forensic document handwriting analysis
3. to recommend writer identification as a technology that can bring artificial intelligence world to the next level .

1.4 Scopes

The scope of this project is to develop a distributed mobile application which serves the functionalities of handwriting analysis using WI technology for forensic document handwriting analysis. Besides the main functionalities of handwriting analysis, this mobile application will also provide administration functions including data management.

Given the name of Forensic Document Handwriting Analysis (FDHA), this mobile application has the following functionalities:

1. register handwriting of a subject
2. upload or capture evidence image
3. perform handwriting analysis
4. register new user account
5. manage user account information
6. register new case
7. manage case information
8. register new subject
9. manage subject information
10. register new evidence
11. manage evidence information
12. viewing handwriting analysis result report

By distributed means the mobile application will be accessing a remote server application (FDHA Server) which serves the core and heavy functionalities to perform analysis of handwriting including the main engine of WI technology, and also communicating and handling the data retrieving and pushing data to and from database.

The target user of this application is Forensic Division of Department of Chemistry Malaysia for forensic document examination tasks. This application will help the division to examine questioned handwriting or signature to determine the authorship. User must have valid account given by the division in order to access and use the application.

There are several aspect considered in this project which includes distributed mobile application, web service for Android, converting image to bytes and recreation of images in Android, WI technology engine, exporting android application package file (APK).

1.5 Project Significance

This purpose of this project is to merge WI technology into mobile application. It allows portability; merging WI technology on mobile devices will improve the range of utilization of WI technology in various types and fields of application.

The rapid development of mobile device technology such as gesture capture, and also with the utilisation of WI technology, will certainly improve user experience in many handwriting identification applications. Some examples are forensic document analysis, business documents analysis, hospital documents analysis, and account transactions.

It plays important roles to promote WI technology as an important mobile technology for many application uses. It also broadens the usage of WI technology to bigger range.

1.6 Expected Output

This project is expected to produce a forensic document handwriting analysis system, named as FDHA system. This system consists of a mobile application, and also a remote server application (FDHA server).

FDHA system is provided for forensic document examination tasks by Forensic Division of Department of Chemistry Malaysia. It has the functionalities to compare and analyse handwriting to list of subjects with sample handwritings. Analysing these handwritings will show the subject with the highest likeliness of handwriting features among others.

Besides providing handwriting analysis functionalities using WI technology on mobile devices, FDHA is also included with administration modules such as account and data management. Administration modules can only be accessed by higher authorities in the forensic division.

1.7 Conclusion

WI technology is a worth-to-be-researched technology with promising result. Merging it with mobile application further exposes the potential of WI technology for much more uses in technology world. This project aims to prove this by building a distributed mobile application to perform handwriting identification tasks using WI technology.

The main advantage of this project is the portability of this technology with the help of mobile devices. With portability, there are much more that could be achieved using WI technology. More users could use the technology at anywhere and anytime.

Besides portability, the functionalities provided by mobile devices such as tablet canvas and camera allow better and much more convenient usage of WI technology for handwriting identification processes.